

Abstract of the Disclosure

5 Genes and methods for optimizing levels of substrates employed in the
biosynthesis of copolymers of 3-hydroxybutyrate (3HB) and 3-hydroxyvalerate
(3HV) in plants and bacteria via manipulation of normal metabolic pathways
using recombinant DNA techniques are provided. This is achieved through the
10 use of a variety of wild-type and/or deregulated enzymes involved in the
biosynthesis of aspartate family amino acids, and wild-type or deregulated
forms of enzymes, such as threonine deaminase, involved in the conversion of
threonine to P(3HB-co-3HV) copolymer endproduct. By these methods,
enhanced levels of threonine, α -ketobutyrate, propionate, propionyl-CoA,
 β -ketovaleryl-CoA, and β -hydroxyvaleryl-CoA are produced. Also provided are
15 methods for the biological production of P(3HB-co-3HV) copolymers in plants
and bacteria utilizing propionyl-CoA produced through a variety of engineered
metabolic pathways. Introduction into plants and bacteria of an appropriate
 β -ketothiolase, β -ketoacyl-CoA reductase, and PHA synthase, alone or in
combination with various enzymes involved in aspartate family amino acid
20 biosynthesis and the conversion of threonine to PHA copolymer precursors, will
permit these organisms to produce P(3HB-co-3HV) copolymers.

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